COURSE OUTLINE

Faculty of Engineering and Information Technology

School of Engineering

1012ENG

Fundamentals of Engineering Mathematics

1 Identifying Information

Course catalogue no:	1012ENG		
Course title:	Fundamentals of Engineering Mathematics		
Field of Education Code			
Year and semester of offer:	2005, semester 2		
Credit point value	10CP		
Program/s for which course is designed	Bachelor of Engineering in Civil Engineering Convenor: Dr. H. Guan Bachelor of Engineering in Coastal Engineering Convenor: Dr. L.Tao Bachelor of Engineering in Electronic Engineering Convenor: Mr. C.Hacker Bachelor of Engineering Technology Convenor: Dr. S. Fragomeni		
Status of Course within program/s or academic plan/s	1st year course Core in: All BEng & Double Degrees BEngTech		
Prerequisites:	1011ENG Mathematics & Computing		
Course convenor		Dr. S. Fragomeni	Room G09 1.02
Teaching team members:		Ms. M. Gorrie	Room G09 1.46
	Moderator:	Dr. Hong Guan	Room G09 1.10
Date course outline was last modified	21/06/05		

2 Objectives

This course aims to equip engineering students with further mathematical skills necessary to become effective as engineers. This course builds on the Prior assumed concepts introduced in the Foundation Mathematics and Computing course with particular emphasis on engineering applications. It is vital that students of Engineering have a sound knowledge of Differential and Integral calculus particularly applied to transcendental functions; and basic Multivariate calculus utilising partial differentiation, 3D geometry, and multiple integrals so that they can become competent problem solvers.

In terms of technical content, the student, upon successful completion of the course, should be able to:

- Review basic principles and methods of differentiation and integration
- apply differentiation and integration techniques with emphasis on transcendental functions
- apply advanced differential and integral calculus to a variety of real world problems
- analyse multivariate problems including partial differentials and multiple integrals including problems in three dimensions.
- Utilise functions in series and solve related problems.
- be confident in those areas of mathematics which are referred to in later courses in their program
- effectively use mathematics as a tool for solving real-world problems encountered in their work as engineers.

3 Links with other Courses in the Program(s)

One of the essential skills of Engineers is the ability to Differentiate and Integrate. They must also have the ability analyse and solve problems in two and three dimensions. The prescribed course will enable students to become familiar with the mathematical tools required to solve most engineering related problems. The mathematical skills attained will be used for a number of courses in later years of their degree Program.

4 Brief Description

To become competent problem solvers, Engineering students need to have a sound knowledge of Differential and Integral calculus particularly applied to transcendental functions; and basic Multivariate calculus utilising partial differentiation, 3D geometry, and multiple integrals. Functions in series are also introduced to solve Calculus problems. Real world problems are addressed in these topics.

5 Content

Module	**Weighting**
0. Preliminary Module - Complex Numbers - Gaussian Elimination	10%
1. Differential Calculus - ***Review:*** derivatives from first principles, rates of change, limits, etc. - ***Review:*** Differentiation rules for polynomials, products, quotients, chain rule + implicit differentiation - Derivative of Transcendental functions includes trigonometric, exponential and logarithmic, and hyperbolic functions - Applications of differentiation - Functions in Series: Taylors Series and Approximations	30%
2. Integral Calculus - ***Review:*** Finding anti-derivatives – rules for indefinite and definite integrals + integral formulas - ***Review: .***General Power rule, integral formulas and substitution method. - Techniques of integration including, trig substitutions, integration by part, partial fractions - Applications of integration: areas under curves, between curves and centroids, volumes, disks and shells	30%
3. Introduction to Multivariate Calculus - Curves and surfaces in space, functions of several variables - Partial differentiation and geometrical interpretation, chain rule - Multiple integrals including: volumes, centroids.	10%

6 Generic Skills Development

This course aims to develop the generic skills indicated below using material relevant to the study of Fundamentals of Engineering Mathematics.

Attribute	Taught	Practiced	Assessed	**Developed through:**
Oral communication				
Written communication				
Problem identification, formulation and solution	√	√	√	Tutorial exercises, assignments and exam
Analysis and critical evaluation		√	√	Tutorial exercises, assignments and exam
Ability to undertake independent lifelong learning				
Ability to initiate and lead enterprises				
Ability to work effectively as a member of a team				
Ability to assume responsibility and make decisions		√	√	Tutorials and assignments
High ethical standards.				

7 Flexible Learning

This course is mainly taught using the prescribed textbook and additional lecture note and study materials available from the course website at Learning@Griffith. Addition information and correspondence is published on the web site.

8 Rationale for Content

One of the essential skills of Engineers is the ability to Differentiate and Integrate. They must also have the ability analyse and solve problems in two and three dimensions. The prescribed course will enable students to become familiar with the mathematical tools required to solve most engineering related problems. The mathematical skills attained will be used for a number of courses in later years of their degree Program.

9 Organisation and Teaching Methods

The contact hours in this course are:

ACTIVITY	HOURS
Lectures	52
Tutorials	13

These contact hours are delivered as 4x1 hour lectures and 1 hour tutorial per week.

10 Rationale for Teaching Methods

The lectures will provide the background, concepts and techniques required to solve mathematical problems, and provide worked examples. Problem solving exercises elaborating on the lecture material will be introduced during the tutorial time. Assignments will consist of textbook-based problems and also involve "real world" applications, and may also incorporate the use mathematical computer packages.

11 Assessment

NO	DESCRIPTION	WEIGHTING(%)
1	Tutorial Assignments	20
2	Mid-semester test (Modules 1 to 3, week 8 or 9)	20
3	Final examination (all Modules, 3 hrs during exam period)	60
		100

In order to achieve the grade of "Pass" or above in the course students must:

- ***satisfactorily*** *attempt all items of assessment*
- *obtain a total of at least* ***50 (fifty) percent*** *for the entire course*
- *obtain at least* ***40 (forty) percent*** *in the final examination.*

12 Rationale for Assessment

The **Assignments** will assess the ability of the student to bring together various aspects of the course material and apply that knowledge to particular real-world problems. The assignments may also incorporate the use mathematical computer packages.
The **Mid-semester Test** (1.5 hr duration**) and Final Examination** (3hr duration) will be closed book and assess the students' understanding and knowledge of the range of topics covered in the course.

13 Texts and Supporting Materials

Specified Texts
Washington, A.J., 2000, *Basic Technical mathematics with Calculus (metric version),* 7th Ed., Addison-Wesley.

Support Materials
Web based materials (including lecture note material) can be accessed under 1012ENG through Learning@Griffith

Recommended Readings/References
Most recent books on Calculus will be of use.
Thomas & Finney, *Calculus,* 10th Ed., Addison-Wesley.
Edwards & Penney, 2002, *Calculus,* 6th Edition, Prentice Hall
Calter, P., 1995, *Technical Mathematics With Calculus,* 3rd Ed., Prentice-Hall
Singh, 2003, *Engineering Mathematics through Applications,* Palgrave Macmillan
Kreyszig, E., 1999, *Advanced Engineering Mathematics* 8th Edition, Wiley Larson, R.,

14 Course Evaluation

A formal survey of the students will be undertaken towards the end of the semester. The teaching team will discuss the results of survey and any necessary modifications to the course planned for the next offering.

15 Administration

Unless otherwise stated, the normal course administration policies and rules of the School of Engineering apply. This policy is on display on the School of Engineering Notice Board and is posted on the Learning@Griffith website under "School of Engineering Students Group/Program Resources".

The attention of students is drawn to the University's Policy on Academic Misconduct. http://www62.gu.edu.au/policylibrary.nsf/mainsearch/352f26aa1a1011e64a256bbb0062fd5f?opendocument . It is recommended that students read this policy.

The course website on Learning@Griffith will be used to provide feedback and information.

16 Course Communications

The Course Convenor is available for consultation at times that are displayed on the Convenor's office notice board (outside G09_1.02).